Natural Resources

Tonset Road, Town Landing

5. Natural Resources

5.1 Overview

Orleans is located on an outwash plain in a temperate environment. The area has a wealth of natural resources that define the attractiveness of Orleans as a place to live. The natural environment also serves a role in the economy, attracting tourism and supporting commercial and recreational fishing. Future growth must be balanced with protecting these resources.

As land development progresses, so does the potential for damage to the environment. Sound land management policies can minimize adverse impacts. Planning is especially critical in coastal and wetland areas where much of the wildlife is fragile and cannot tolerate environmental changes. However, due to the beauty and uniqueness of these resources, areas near these features are desirable for development.

Clearly, human impact on natural resources is an issue that is multifaceted. One of the most pressing natural resource issues is the effect of nutrient loading on ground and surface waters. One of the highest priorities for the Town is to develop wastewater management solutions that will ensure protection of drinking water and the health of ponds, lakes, and coastal embayments.

Much of Orleans' economic, recreational, and environmental livelihood depends on natural resources. This chapter provides a description of Orleans' natural resources including an abundance of coastal areas, surface and ground water, and wetland. Of the 21 square miles that comprise the Town of Orleans, over one third is surface water or wetland. By analyzing this comprehensive inventory, potential actions and implementation strategies can be formulated based on the Town's goals regarding natural resources.

5.2 Goals & Policies

Groundwater Resources Goal

All new public supply wells will provide high quality drinking water without the need for treatment of biological or industrial contamination.

Policies

- Nitrate-nitrogen loading standards should be adopted that protect surface and ground waters, using as guidance a goal of 5 ppm nitrate-nitrogen loading for new development and redevelopment.

- Septic systems and other sources of contamination should be sited so as to avoid contamination of existing or proposed wells.

Ensure that the mass of nitrogen entering coastal waters does not exceed a level that would accelerate natural eutrophication.

Policies

- Maintain nitrogen loading levels at a point below that which will accelerate natural eutrophication for all watersheds to coastal waters.
- Upon completion of the Town's wastewater management plan, set nitrogen loading limits for each watershed area, encompassing the entire town.
- Involve Harwich, Brewster, and Eastham in the development of nitrogen loading limits in watersheds that extend into those towns, to the extent possible.

Surface Water Resources Goal

To preserve and improve the ecological integrity of fresh and marine waters.

Policies

- The Town shall regularly monitor the health of local surface waters.
- Surface water standards should be set to ensure a suitable habitat for the protection and propagation of desirable fish, shellfish and other aquatic organisms; and to support fish and shellfish that are free of contamination that could pose a human health risk; and to ensure that the Town's waters are suitable for swimming without human health risk.
- In order to limit phosphorus inputs, no subsurface disposal systems should be permitted within 300 feet of mean high water of fresh water ponds unless the applicant demonstrates by a ground water study that the site's groundwater is not discharging to the pond. Where strict interpretation of the requirement would result in a regulatory taking, the setback to the pond should be the maximum feasible.
- Nitrate-nitrogen loading standards should be adopted that protect surface waters, using as guidance a goal of 5 ppm nitrate-nitrogen loading for new development and redevelopment.

Coastal Resources Goals

- To maintain coastal water quality that allows fishing, shellfishing, and/or swimming in all three estuaries, and to protect those coastal ecosystems which support shellfish and finfish habitat.
- To ensure that the Town maintains the integrity of its beaches for residents and visitors to enjoy.

- To limit development in areas subject to coastal storm flowage, particularly high hazard areas, in order to minimize the loss of life, structural and environmental damage resulting from storms, flooding and erosion.

Policies

- Development and redevelopment along the coastline should not interfere with existing public access and traditional public rights of way and environmentally appropriate use of the shoreline.
- Public access to the shore should be encouraged where such access will not impair natural resources.
- Carrying capacity of all shore areas should be assessed before expanding parking areas or otherwise allowing greater use.
- No new direct, untreated stormwater discharges should be permitted into any coastal waters, wetlands, or fresh water ponds, including discharges above or below the mean high water level.
- Stormwater management systems proposed in V-zones should be designed to have a base elevation two feet above the base flood elevation. For systems proposed in A-zones, the base elevation should be designed to be one foot above the base flood elevation. In situations where this cannot be achieved due to low elevation, the Town may allow a system that provides maximum feasible compliance.
- All public or private commercial marinas should provide or contribute to the provision of adequate boat sewage pump-out facilities in each harbor and should provide restrooms for their patrons. Such marinas should also provide or contribute to provision of adequate collection facilities for solid waste and waste oil for their patrons.
- New dredging projects or expansion of existing dredging projects should not be permitted unless a substantial benefit can be demonstrated For example, enhancement of fish or shellfish habitat, necessary improvements to navigational safety or maintenance of economic viability.
- To accommodate relative sea level rise, all new buildings should have the lowest floor set one foot above the base flood elevation in FEMA A-zones and two feet above the base flood elevation in FEMA V-zones, as shown on the most recent FEMA maps at the time of application.

- No new development or redevelopment should be permitted on barrier beaches and coastal dunes as defined by the Wetlands Protection Act and associated regulations and policies. Existing structures may be reconstructed or renovated, provided there is no increase in floor area (unless a public benefit can be demonstrated) or intensity of use, or conversion from seasonal to year round use.

    A. If the reconstruction/renovation is greater than 50% of the replacement cost of a structure, and is located within a V-zone, the lowest horizontal structural member should be elevated at least two feet above the 100 year flood elevation. If the structure is located in the A-zone, the lowest floor should be elevated at least one foot above the 100 year flood elevation. On a barrier beach or coastal dune and in either the V- or A-zone, the structure should be on open pilings, to allow for storm flowage and beach and dune migration.

B. If the structure is on a barrier beach or dune and is outside the 100 year coastal floodplain, and is proposed to be reconstructed/renovated greater than 50% of its replacement cost value before reconstruction and renovation, it should be elevated at least two feet above grade on open pilings to allow dune migration.

Water-dependent public recreational facilities in these locations may be developed providing that it can be demonstrated that the proposed development will not compromise the integrity of coastal resources, and are appropriately elevated on pilings or floodproofed.

- Where fire, storm, or similar disaster has caused damage to or loss of buildings in FEMA A- and V-zones, on barrier beaches, coastal banks or coastal dunes of greater than 50 percent of their replacement cost, all reconstruction should be in compliance with current applicable regulations. Any reconstruction should not enlarge or expand the use of an existing structure.
- Except in village centers, no new public infrastructure or expansion of existing infrastructure should be made in flood hazard zones (FEMA A- and V-zones) unless it is shown that there is an overriding public benefit provided, and provided that such infrastructure will not promote new growth and development in flood hazard areas.
- Where land subject to coastal storm flowage is significant to the interests of flood control and storm damage prevention, no activity should increase the elevation or velocity of flood waters or increase flows due to a change in drainage or flowage characteristics on the subject site, adjacent properties, or any public or private way.
- Within the 10 year floodplain no activity shall impede the landward migration of other resource areas within this area of the floodplain. Relative sea level rise and the landward migration of resource areas in response to relative sea level rise shall be incorporated into the design, construction, and location of structures and other activities proposed.

Wetland, Wildlife and Plant Habitat Goals

- To ensure no loss of wetlands in Orleans will occur through development.
- To prevent loss or degradation of critical wildlife and plant habitat, minimize the impact of new development on wildlife and plant habitat, and maintain existing populations and species diversity.
- To protect standing specimen trees.
- To protect all vernal pools in the Town.

Policies

- Wetlands should not be altered except (a) for water-dependent projects where there is no feasible alternative and where appropriate mitigation is implemented, or (b) for installation and maintenance of utility lines where disturbed wetland areas are restored following construction or maintenance activities.
- Vegetated, undisturbed buffer areas of at least ***100-foot*** width should be maintained from the edge of coastal inland wetlands including isolated wetlands, to protect their natural functions. This policy should not be construed to preclude pedestrian access paths, vista pruning, or construction and maintenance of water dependent structures, or dwellings,

within the buffer area, any of which may be permitted at the discretion of the Conservation Commission where there is no feasible alternative location or method available.

- Untreated stormwater should not be discharged directly into natural wetlands and waterbodies. New stormwater discharges should be located a minimum of 100 feet from wetlands and waterbodies.
- Developments should be planned to minimize impacts to wildlife and plant habitat.
- Clearing of vegetation and alteration of natural topography should be minimized, with native vegetation planted as needed to enhance or restore wildlife habitat.
- Fragmentation of wildlife and plant habitat should be minimized by the establishment of greenways and wildlife corridors, as well as by the protection of large unfragmented areas, and the use of open space planning.
- Development should be prohibited in vernal pools and within a 100 foot buffer around these areas, unless such buffer would result in a regulatory taking. In such cases, development should be designed to achieve maximum feasible compliance, as determined by the Conservation Commission.

5.3 Inventory

5.3.1 Coastal Resources

The coastal waters of Orleans are among its most prized attributes and one of the principal reasons that Orleans is such a desirable place to live and visit. The town has three separate productive estuaries within its borders – Cape Cod Bay, Nauset Harbor/Town Cove and Pleasant Bay, as well as frontage on the Atlantic Ocean.

Harbors & Bays

The Town of Orleans includes 9 square miles of Cape Cod Bay. Resources include three separate salt marsh systems (Namskaket, Little Namskaket and Rock Harbor Creek). Quahogs, scallops, lobster, and a large variety of commercially and recreationally important finfish such as bass, bluefish, flounder, tautog and tuna, populate deep water.

Nauset Harbor/Town Cove, which includes Nauset Marsh, is more than 1.8 square miles in size and is shared with the Town of Eastham. The estuary is widely used for many types of fishing. It is flanked by the Cape Cod National Seashore on the north and portions of the estuary are included within the National Seashore boundary. It is the most productive estuary for shellfish, exclusive of quahogs, in Orleans. It is a habitat for 59 species of fish and shellfish, and more than 90 species of other invertebrates (Roman et al 1989). The Atlantic Ocean is accessible from Nauset Harbor through a very unstable and narrow inlet. Nauset Spit, the barrier beach protecting the estuary, is a breeding area for several species of birds including rare terns and a threatened species, the piping plover.

Pleasant Bay, is 5.4 square miles in size and extends beyond the border of Orleans though Harwich into Chatham. The barrier beach is included in the Cape Cod National Seashore. Pleasant Bay is highly regarded for its prodigious amounts of fish, especially bass and bluefish. The bordering ponds associated with Pleasant Bay are known breeding territory for winter flounder. Historically, Pleasant Bay was an important area for quahogs with occasional large sets of bay scallops.

Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) in Massachusetts are designated by the Secretary of Environmental Affairs in order to identify and protect critical resource areas, including wetland and wildlife habitats, farmlands and scenic landscapes. Once an area is designated as an ACEC, all new developments must be reviewed under the Massachusetts Environmental Policy Act. A development or proposed use is not allowed in an ACEC if it is determined that it might have adverse environmental impacts on the area.

The Commonwealth has designated both Pleasant Bay and Cape Cod Bay as ACECs. The performance standards of the Conservation Commission for the Nauset System are the same as ACEC standards.

Shellfishing Areas

Shellfishing, a historic industry in Orleans, is still economically important. The Town is fortunate to have four major species within its waters: soft-shell clams, quahogs, scallops and mussels. Stock abundance fluctuates depending on natural conditions and harvest demands. In the last 5 years of harvest data available, the value of commercially harvested shellfish has been as high as 1.4 million dollars and as low as four hundred thousand dollars demonstrating the cyclical nature of the harvest.

Water quality must be maintained at a high level in order to be classified as open for shellfishing. With some exceptions, water quality has remained high enough to allow shellfishing. The Town continues to implement measures to protect its resources through a drainage remediation program, wetland regulations and environmental and wastewater planning.

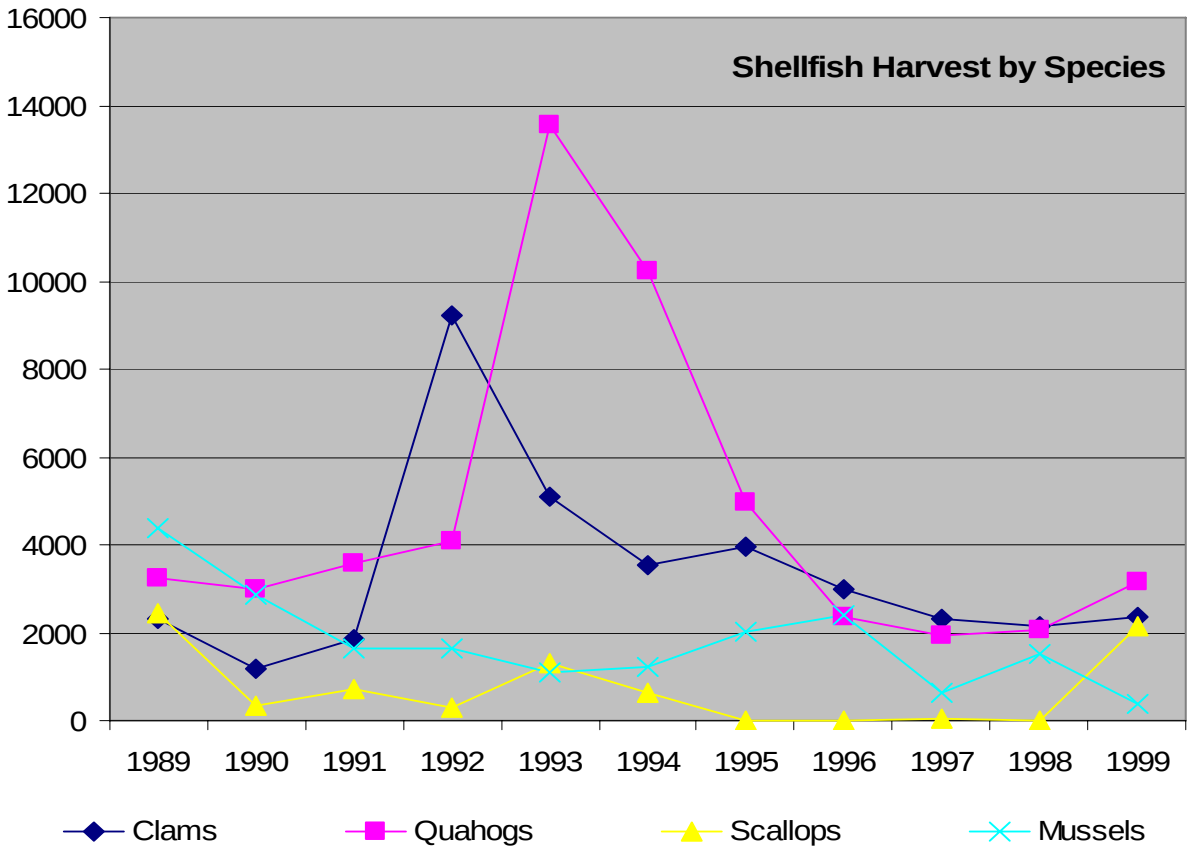
Level of Activity

In 2003, there were 198 commercial and 1,051 recreational shellfishing permits issued. Enforcement of shellfish regulations is performed by the Shellfish Department. The department has 2 year-round employees and 3 seasonal staff who assist with oversight and enforcement.

Catch reports, and total commercial value, identify that shellfish harvests since 1970 represent a cyclical nature of species populations. Staple species for local shellfishermen include quahogs and steamer clams. Less important species include scallops, mussels, and razor clams. Harvest statistics for any one species may be due to abundance or economics. Most species, especially scallops, are well known for the wide fluctuations in abundance. In past years high populations

of Green Crabs, a predator species to some shellfish, have reduced the amount of scallop brood stock having an effect on the abundance of the species.

Figure 5 - A



Propagation

Orleans has an active shellfish propagation program. Each year, the Town purchases seed quahogs and scallops that are released into local waters to grow to market size. The number of shellfish purchased each year has been .5 million to 1.5 million, depending on the availability of funds. The Shellfish Department has also participated in relay projects in which contaminated shellfish were harvested from other areas in the Commonwealth, shipped to a depuration plant, then transplanted to local waters. In June 2004, using grant funds from Barnstable County, the Town purchased 100 bushels of quahogs for transplanting.

From 1975 to 1990, the Town operated a shellfish propagation lab on the shore of Town Cove near the Goose Hummock Shop. Staff experimented with nursery and grow-out techniques, and produced up to one million seed shellfish annually. In 1990, it was determined that the local lab was not cost-effective and it was closed.

In recent years, the Shellfish Department has been successful in obtaining state and federal grants for a number of shellfish propagation projects. The department has experimented with catching spat on various media, evaluated, and utilized different grow-out box designs.

Aquaculture

Orleans has a small aquaculture industry, with 24 private grant holders (22 in Pleasant Bay, 2 in Nauset Harbor) who primarily grow quahogs and oysters. The Pleasant Bay Management Alliance has developed a format for a sediment survey of the bay's floor to be performed by Northeastern University to determine the potential for future aquaculture opportunities. The survey work is currently on-going.

Working Waterfront

Historically, Orleans' harbors and bays have been working waterfronts. Abundant fisheries were instrumental in the settlement of Cape Cod, and still play a role today. Rock Harbor, home to a winter fleet of quahog boats, also hosts the largest charter boat fishing fleet on Cape Cod in the summer months. Nauset Harbor and Pleasant Bay support a variety of fishermen, predominantly oriented towards shellfishing and lobstering.

Orleans currently has 4 water-dependent commercial areas: Goose Hummock Shop and Nauset Marine in Town Cove; Nauset Marine East Marina on Meetinghouse Pond; Arey's Pond Boatyard in Arey's Pond (Pleasant Bay); and the Rock Harbor fleet on Cape Cod Bay.

Shallow waters and shifting sands create less than ideal conditions for fishing boats. Rock Harbor is a tidal harbor usable only 2 hours before and after high tide. Nauset Harbor has constantly changing shoals and an extremely hazardous inlet to the Atlantic Ocean. Today, town landings are being used for fishing and shellfishing, as well as for commercial ventures such as tour boats, charter fishing, and rental of kayaks. Coastal Banks

Coastal banks of varying slopes and heights face the force of storms depending on the tide and wind direction. Even if they are well-vegetated and stable, a bad storm can undermine the toe of the bank causing it to slump and form a steeper grade. It is difficult for vegetation to grow on steep banks as they erode faster than those with a stable grade. The eroding soil from the bank serves a valuable function of supplying sediment to marshes and beaches.

The high coastal banks have the most commanding water views in town. Accordingly, most have been developed and many houses are constructed within 50 feet of the top of the coastal bank. Homeowners, fearful of the loss of valuable property, have requested permission to protect their banks and slow the rate of erosion.

The Town has permitted revetments totaling more than 1.5 miles of shoreline. The majority of the hazard prone shorelines have been protected through the construction of massive rock revetments as well as less imposing structures made of gabions (wire mesh filled with rocks) or coco fiber rolls. These structures reduce beach nourishment, an adverse impact of limiting

erosion. Because the natural systems are impacted, any new applications for revetments or other "hard" erosion control structures should be carefully evaluated before being approved.

5.3.2 Water Recreation

There are 24 town landings. Ten of these landings contain launching ramps for boat access. Parking is available at all but one of these facilities, though additional land for parking is scarce. Most of the town landings are little more than roads that end at the water. There is a waiting list for mooring space at many town landings.

The Marine Resources Survey (see appendix) indicated that expansion of parking at town landings was not a high priority, even though several landings are congested in the summer, especially on peak season weekends.

Priscilla Beach and Snow Shore Landing are the principle landings used for commercial fishing operations within Nauset Inlet. Conflicts arise between commercial and recreational users over equipment stored on the beach, odor of bait, and shortage of mooring space for non-commercial users since preference is given to commercial boat owners.

The following is a list of town landings that provide or enhance access to water bodies.

Table 5 - A: Town Landings

Location	Estuary	Ramp	Location	Estuary	Ramp
Rock Harbor	Cape Cod Bay	Y	Barley Neck (2)	Pleasant Bay	N
Goose Hummock	Nauset Harbor	Y	River Road	Pleasant Bay	Y
Yacht Club	Nauset Harbor	Y	Lonnie's (1)	Pleasant Bay	Y
Asa's Landing	Nauset Harbor	N	Lonnie's (2)	Pleasant Bay	N
Gibson	Nauset Harbor	N	Arey's Lane	Pleasant Bay	N
Ruggles Road	Nauset Harbor	N	Namequoit	Pleasant Bay	N
Tonset	Nauset Harbor	N	Portanimicut	Pleasant Bay	Y
Snow Shore	Nauset Harbor	N	Quanset	Pleasant Bay	Y
Roberts Cove	Nauset Harbor	N	Route 28	Pleasant Bay	N
Mill Pond	Nauset Harbor	Y	Pochet (Sparrowhawk)	Pleasant Bay	N
Doane Way	Nauset Harbor	N	Gilman Lane.	Pleasant Bay	N
Priscilla Beach	Nauset Harbor	N	Briar Spring	Pleasant Bay	N

Rock Harbor is home to a recreational and commercial sportfishing fleet. Maintenance dredging to keep the harbor open was last done in 1992 and again in fall of 2004. Dredge spoil has been placed on coastal dunes in both Orleans and Eastham. Dock and bulkhead facilities were reconstructed in 1999. Increasingly cold winters and subsequent ice flows sometimes displace the fender pilings. The Town is anticipating significant work at Rock Harbor involving the

replacement of a portion of the main bulkhead in fiscal year 2009 and has included this future work in its Capital Plan.

Boats of all types are being used for recreational and commercial activities including finfishing for bass, bluefish, flounder; shellfishing and lobstering. Gaining in popularity throughout the town are self-propelled forms of water craft such as canoes, kayaks and rowing skiffs. Pleasant Bay has historically been a mecca for sailboats and sailing remains popular. The Orleans Yacht Club has held sailing classes and races for many years in Town Cove.

Personal Watercraft

Personal Watercraft, commonly known as jetskis or waverunners, have been recently regulated in Orleans. The number of complaints about the noise, speed, and careless operation of these watercraft were enough for the Town to adopt regulations in the General Bylaws dealing with their operation. At the 2001 May Annual Town Meeting the Town voted to not allow Personal Watercraft to operate in the waters of Pleasant Bay, the Nauset Estuary, and within the boundaries of the National Seashore. The Town does still allow operators of PWC to launch at Rock Harbor and use their craft in Cape Cod Bay.

Aquifer and Groundwater

Orleans relies on the Monomoy Lens as its sole source aquifer for the municipal water supply. The municipal water supply is drawn from an area of nearly 500 acres located west of Route 28 in South Orleans, an area commonly referred to as the Watershed. An additional well site closer to Pleasant Bay has one well (#7). Groundwater in this area is part of the Monomoy lens of the Cape Cod Aquifer, an EPA designated sole source aquifer. The Monomoy lens, one of 6 distinct lenses on Cape Cod, spans the areas of the towns of Yarmouth, Dennis, Harwich, Chatham, Brewster and Orleans. The Orleans watershed is at the eastern edge of the Monomoy lens. The groundwater direction of flow to Orleans municipal supply wells is from west to east, primarily from the town of Brewster. Detailed information about the Monomoy lens can be found in the "Monomoy Lens Groundwater Protection Project," completed in December 1995, by the Cape Cod Commission.

As part of the research performed in preparation for this Plan, the Town retained the services of the Cape Cod Commission Water Resources Office to conduct a groundwater assessment for Orleans. Included in the report were maps showing (1) the locations of groundwater monitoring wells, (2) elevations of the groundwater table, and (3) identifying subsurface ground watersheds. These maps provide valuable information regarding the depth to groundwater, flow direction and contributing watersheds to each estuary which can be used to monitor water quality. Specific detailed information on the town's groundwater resources is available in the final report entitled "Orleans Water Table Mapping Project" dated May 1995.

Orleans has 7 wells capable of pumping nearly 5.0 million gallons per day (MGD). The potential site for adding an eighth well is currently in the licensing process. Detailed information on the infrastructure associated with the water supply is provided in the Community Facilities and Services Chapter.

Groundwater Protection

To further protect the groundwater, the Orleans Zoning Bylaw was amended in 1991 to include the delineation of Groundwater Protection Districts which provided a “legal framework for the protection of the Town’s groundwater resources" (Orleans Code 164-17). The bylaw regulates land usage within districts varying as to their proximity and direction of ground water flow to the wellfields.

- District 1 includes the Watershed and the land around Well #7. Two additional parcels totaling 11 acres were purchased in 2002, with land bank funds, abutting the Watershed at the intersection of Rt 28 and Namequoit Road. Regulations state that only those uses that directly or indirectly relate to the protection or production of Town drinking water are allowed. All other uses are prohibited.
- District 2 consists of all land located within the Zones of Contribution for the public supply wells as determined by the Cape Cod Commission except for those zones of contribution which are within District 1. This district has land use regulations such as requiring that 30% of a lot is to be retained in its natural state and 60% of the lot area must be pervious to water. Storage and/or use of toxic or hazardous materials are prohibited. The installation of a sewage disposal system with a wastewater flow greater than 110 gallons per day per 10,000 square feet of lot area or 15,000 gallons per day regardless of lot size is also prohibited.
- District 3 is further from the wellfield and allows larger sized septic systems for residential development (only) but still prohibits the storage and/or use of toxic or hazardous materials and requires that 30% of the lot remain in its natural state.
- District 4 encompasses all areas not otherwise delineated and reverts to the remainder of the Zoning Bylaw.

5.3.3 Surface Water: Lakes and Ponds

The Town contains 107 areas of surface water with a total area of 233 acres. Water bodies range in size from less than 100 square feet to 45 acres (Pilgrim Lake). Seventeen of these areas are freshwater kettle ponds of two acres or greater. These water features are an important asset to the natural resources of the town as they provide wildlife habitat, recreational opportunities, and scenic landscapes.

Swimming, fishing, and boating in small craft are possible in many of the larger ponds. Baker’s Pond, Cedar Pond, Crystal Lake and Pilgrim Lake are over 10 acres in size and are considered “Great Ponds.” The state owns the bed and waters of all Great Ponds. The remaining 13 ponds are located throughout town with 5 ponds clustered in South Orleans (Uncle Seth's Pond, Shoal Pond, Deep Pond, Twinnings Pond, and Sarah's Pond). Gould Pond and Wash Pond are located in the watershed area. All ponds, with the exception of Icehouse Pond in East Orleans, which is perched on a clay deposit, are visible extensions of the groundwater. They are dependent on the fluctuation of the aquifer's water table for their own surface level.

The activities at three of the Great Ponds - Pilgrim Lake, Crystal Lake, and Baker’s Pond - are particularly important to recreation. Pilgrim Lake, which hosts the town's swimming classes, is

a very popular recreational area especially for small children. Amenities include floats for shallow and deep swimming, rest room facilities and parking. Crystal Lake is also popular for swimming but has only small parking areas on Route 28 and Monument Road. The Monument Road landing includes a sand beach and a ramp accessible to the physically challenged with a platform for fishing. Baker's Pond has a Commonwealth fishermen's landing, and the Town owns a conservation area with panoramic views of the water. Baker's Pond is stocked with trout by the Commonwealth annually.

All three lakes are important to wildlife, especially finfish. Pilgrim Lake is the one remaining terminus spawning pond for anadromous herring, that arrive each spring to spawn and whose offspring return to the sea in the fall. Historically, Crystal Lake was also a herring run as were several other ponds including Cedar Pond and Uncle Seth's Pond. Crystal Lake has been stocked for years with trout from the Massachusetts Division of Fish and Game.

The kettle ponds on the lower cape tend to be naturally acidic because of the lack of buffering capacity with the soil, unless they are influenced by their proximity to salt water. Acidic ponds support fewer pond plants and appear clear. Baker's Pond has been limed by the State Division of Fisheries and Wildlife to reduce acidity and support trout.

5.3.4 Wetlands

Wetland resources are important environmentally and for historical reasons. They provide important natural functions such as flood control, groundwater recharge, filtering of pollutants and nutrients, and providing wildlife and fisheries habitat. Wetlands offer recreational opportunities, such as birdwatching, fishing, and boating, as well as economic opportunities such as cranberry production. The buffer zones to these areas are not only the most likely to have archaeological significance but also the most likely to be developed.

Conservation Regulations

Orleans' Wetlands Bylaw builds on State provisions and includes some items that are stricter than the State Wetlands Act, MGL 131 s. 40:

1. State Act requires fresh water wetlands to be bordering on another resource area in order to be considered. The local Bylaw eliminated this requirement, so that isolated wetlands are also under local jurisdiction;
2. The Bylaw recognizes aesthetics as part of the approval criteria, which the State Act does not.
3. Orleans' Bylaw does not allow wetland replication as a mitigation measure.

Work that takes place in a coastal or inland resource area, as defined by the statutes above, is similarly regulated. The crux of the difference between the State and Town wetlands regulations is in the treatment of work in the buffer zone, which is defined as 100 feet landward of the most landward resource. For example, a coastal bank is more landward than a beach or marsh, and therefore it becomes the resource from which a 100-foot setback is measured.

Orleans has recognized that much development takes place in the buffer zone. Many homes have been built over time about 50 feet from the edge of a resource area. Therefore, the regulations attempt to manage the area from the edge of the resource area more strictly than land farther removed from the wetland. The first 25 feet of the buffer zone must be maintained in its natural state, including all natural vegetation. Between 25 feet and 50 feet, only those activities that will enhance the resources are to be permitted. Beyond 50 feet, construction can take place, subject to the review of the Conservation Commission.

Salt Marshes

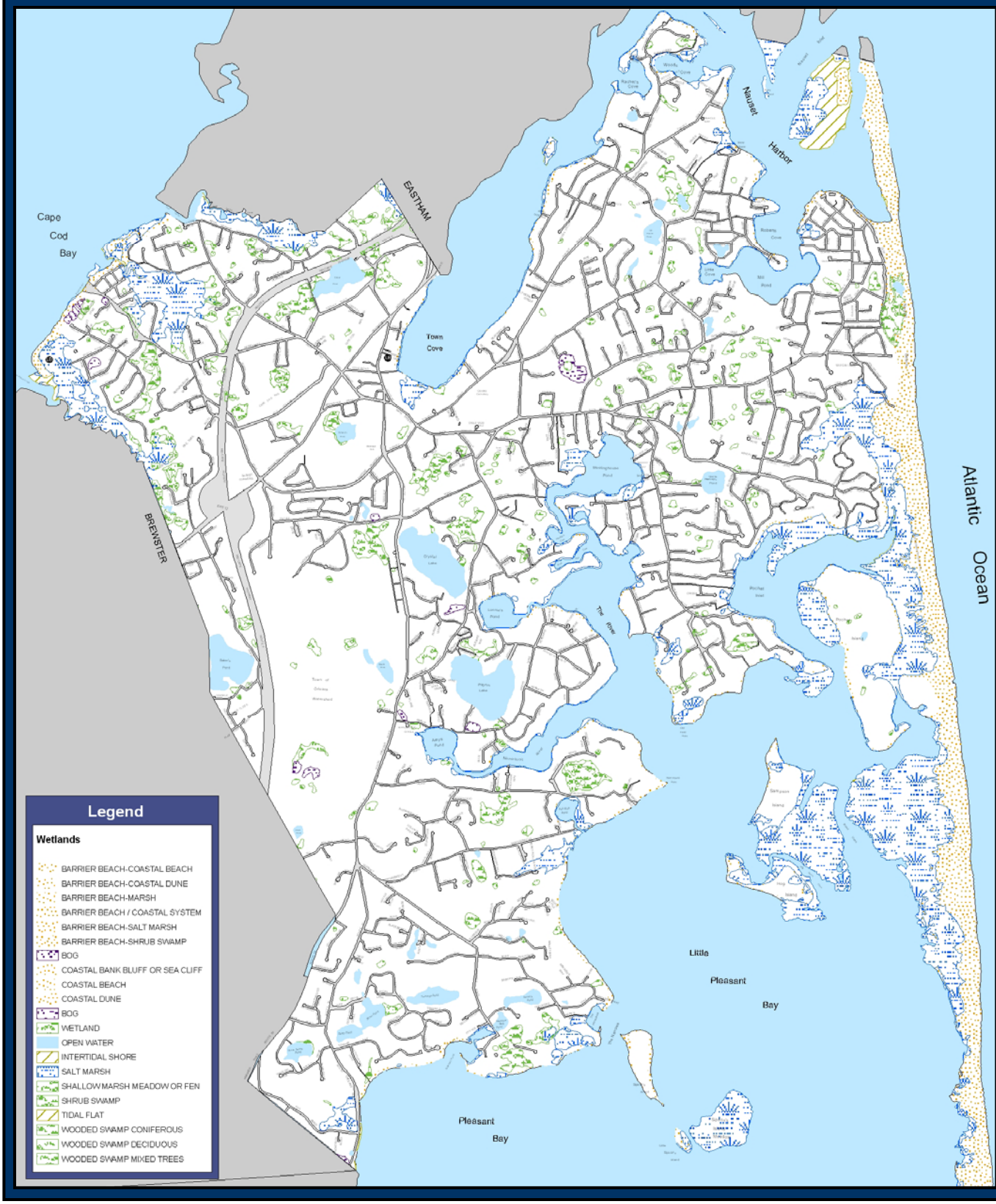
Salt marshes play a vital role in the overall productivity of the estuaries. They are among the most productive ecosystems on earth and are home to a myriad of species. They provide habitat for countless species of plants and animals.

Salt marshes fall into two basic categories: large expansive marsh systems and fringe marshes. Orleans has large marsh systems in all three estuaries; Cape Cod Bay, Nauset/Town Cove and Pleasant Bay. Cape Cod Bay and Pleasant Bay have been designated as Areas of Critical Environmental Concern (ACEC) by the Commonwealth, and contain significant marsh systems (see Wetland Map). Overall, the town has 900 acres of salt marsh. The Nauset/Town Cove estuary has extensive marshes, the majority of which are in Eastham but there is a substantial marsh at the head of Town Cove. Cape Cod Bay has long marshes along the banks of Namskaket Creek, Little Namskaket Creek, and Rock Harbor. Pleasant Bay has extensive marshes on the west shore of the Nauset barrier beach and around Pochet, Sampson, Hog and Little Sipson's Islands.

All three estuaries also have fringe marshes - ribbons of marsh paralleling shorelines in areas of relatively low wave energy. Salt marshes help protect the shoreline by diffusing wave energy during storms. Rare species breed on the borders of the saltmarsh such as the diamondback terrapin.

In some respects, marshes are resilient to man's activities, but actions such as filling or building a revetment can eliminate a marsh system. The Orleans Wetland Bylaw augments the Wetlands Protection Act which protects salt and freshwater wetlands. Alteration to any wetland resource is prohibited except by strict variance procedure.

Orleans Comprehensive Plan: Wetlands



Freshwater Marshes

The total area of freshwater wetlands is estimated to be 150 acres but the exact figure is unknown. Not all local wetlands are found at low elevations below the water table, some are perched above a clay barrier in the soil. Wetland locations in developed areas have been recorded, but borders of known wetlands can expand in extremely wet years (such as 1996-1997). Wetland plants can thrive if there is enough water for a substantial portion of the year. Many rare plants grow around the borders of coastal plain ponds and bogs. Historical records in Orleans from the Massachusetts Natural Heritage Program identify the following pond shore species: pondshore knotweed, Plymouth gentian, black-fruited spike-rush, umbrella grass, and terete arrowhead.

A significant threat to salt and fresh water marshes is phragmites, an invasive plant that has become dominant in many wetlands in the region. Once this plant is established in an area, it takes over, displacing native species and reducing ecological diversity of the wetland. Phragmites has been observed in Town Cove, Meetinghouse Pond, and many other locations. The solution to this problem is difficult and complex, but it remains an obstacle to maintaining natural diversity in the marshes.

Invasive Species

Invasive Species establish easily, grow and spread rapidly, and are typically difficult to remove or destroy once they begin to proliferate. They commonly destroy habitat, threaten endangered species, and supplant the vegetation that makes Cape Cod unique. Orleans has established an Invasive Species Committee that is using volunteer help to identify and map invasives around town. The Committee is dedicated to gathering and conveying information on the presence, distribution, ecological impacts, and management of invasive plant species. In conjunction with the Conservation Commission, they are promoting the use of native or non-invasive, alternative plants throughout the town, and are working cooperatively with researchers, organizations, government agencies, and the general public to identify and encourage the management of invasive species.

Vernal pools

Vernal pools fill with water seasonally and are usually dry by the middle of the summer. Without continual water, these pools will not support fish. Vernal pools are a breeding habitat for amphibians, including some rare species, because of the absence of fish which would feed on their eggs and young. Under the revised Wetland Protection Act, all certified vernal pools are subject to protection. There are 40 certified vernal pools in Orleans.

White Cedar Swamps

The 1990 Critical Habitats Atlas for Cape Cod identifies six separate wetlands dominated by Atlantic White Cedar in Orleans, most of which are privately owned. However, a six acre white cedar swamp located at the head of Little Namskaket Creek is owned by the Orleans Conservation Trust and the Town owns 22 acres of a white cedar swamp on Namequoit Road.

5.4 Analysis

5.4.1 Coastal Resources Analysis

Shellfish Analysis

Level of Activity

While the Shellfish Department has been able to add purchased seed to the local resource, they lack the manpower necessary to expand the existing program or to monitor survival rates necessary to evaluate the success of the program. During the summer season, the Department has a staff of five, which also provides harbor management and enforcement services. This can be compared to Chatham, which has a larger fishery and employs up to 15 part-time shellfish constables in the summer. Consideration should be given to increasing staffing in the Shellfish Department.

The Shellfish Department has in the past worked with the schools on environmental education. It may be practical in the future to develop a curriculum that involves students in monitoring shellfish stocks and/or assisting in shellfish propagation programs. (NR-1)

Propagation

The Town abandoned its shellfish hatchery in 1990. At the time, it was not a cost-effective means of developing seed stock to augment the local resource. Since that time, significant innovations have occurred in the aquaculture industry that could be utilized in a local hatchery. A shellfish hatchery would likely require the efforts of a full-time aquaculturist, but could yield benefits to the local shellfish industry that would outweigh the costs. If a hatchery was successful in increasing local shellfish stocks, it would seem appropriate that a portion of the fees for shellfish permits be used to fund the operation of the facility. (NR-2, NR-3) To do this the Town would have to establish a revolving fund based on permit fees that would be used for resource enhancement programs. (NR-4)

Aquaculture

Shellfish grants have been demonstrated to be economically viable in Pleasant Bay and Nauset Harbor. There are currently no plans to expand the number of grants, but the potential should be explored. (NR-5) To that end, the Pleasant Bay Management Alliance has begun surveying Pleasant Bay to determine which areas, if any, may be suitable for future grants, work is currently on-going. Nauset Harbor has already been determined to have such abundant natural shellfish resources as to preclude any expansion of shellfish grants in the future.

An expanded aquaculture program in the town could have a number of benefits. Cultured shellfish would augment the natural fishery providing seed that would be carried by tidal currents to natural areas. The industry is also an environmentally benign form of economic development. Increased aquaculture activity would generate revenue for growers, much of which would likely be spent in local shops.

There are several issues that must be considered before additional grant areas are approved. Navigational hazards caused by pens and markers must be minimized to avoid conflicts with recreational boaters. Aesthetic issues are a concern to waterfront neighbors. The impacts of wildlife habitat loss and reduced genetic diversity should also be evaluated. The benefits and impacts of expanded aquaculture in the town should be fully explored.

Overall Shellfish Management

An overall shellfish management plan is needed to establish methods for maintaining and enhancing shellfish stocks. (NR-2) An inventory of shellfish habitat areas should be conducted to determine baseline data as to the type and abundance of shellfish in each area. Shellfish users groups need to be identified, including non-fishermen who might be affected by shellfish activities or future aquaculture, i.e. waterfront property owners, recreation boaters, etc. Areas of local waters that need attention should be prioritized. These may include land uses that affect water quality, shellfish beds that experience over-harvesting, and the possibility of setting aside areas for recreational permit holders. (NR-3)

Shellfish resources provide benefits to the community in quality of life, residential enjoyment, and economic benefits. This plan recommends that an overall shellfish management plan be developed and funded to ensure continued viability of shellfish resources.

Coastal Water Quality

The major pollutant sources that affect coastal waters have been determined to be atmospheric deposition, septic systems, stormwater runoff, and domestic fertilizers for lawns. Scientific data varies as to the percentage of total nitrogen contributed from each source. As a rule of thumb, the source of non-atmospheric nitrogen loading is approximately 75% from septic systems, 15% from fertilizers, and 10% from stormwater.

Flushing times of local embayments play an important role in determining what the water quality will be in the bay. Areas with slow flushing times, such as salt ponds, are more sensitive to pollutant loading because the pollutants have a higher residency time in the water body. Biological and chemical pollutants contribute to water quality degradation, impacting the natural ecology and the quality of life of people who use the shore.

Past Studies and On-Going Research

In 1991 the Buzzards Bay Project (USEPA and EOEA, 1991) reviewed water quality information for coastal embayments and correlated the effects of nitrogen loading in rapidly-flushed shallow embayments to the residence time of the water in them. In larger bodies of water with a long residence time, the size of the pond and the amount of nitrogen entering the system could be used to estimate nutrient loading.

In 1997, the Woods Hole Oceanographic Institute modeled the flushing times for Nauset Harbor/Town Cove based on one and two inlets. The calculations were based on the present situation of one inlet. The findings indicated that although the main body of the embayment

flushed rapidly (every 14 hours), Mill Pond took 16 days and Salt Pond in Eastham took 113 days to flush.

In 1998, a study on nitrogen loading in Pleasant Bay was completed by the Water Resources Office of the Cape Cod Commission. The study incorporated building density, groundwater flow and flushing rates to determine limits of nitrogen that the embayments could assimilate with no adverse effects. These flushing models can be used to estimate nutrient loading and land use policy decisions. The study found that the upper salt ponds of Pleasant Bay were approaching eutrophic levels. Ponds affected include Arey's Pond, Kescayogansett Pond, Pah Wah Pond, and Meetinghouse Pond. Further development within the watersheds bordering Pleasant Bay will exacerbate the situation unless nutrient loading can be reduced.

In October 2000, Orleans began the process of developing a town-wide Wastewater Management Plan with the formation of Wastewater Management Steering Committee. Wastewater planning in Orleans is seen as the lynchpin to the town's future. The process currently under way will have an impact on the natural environment, and also impacts village center planning, affordable housing, and economic development.

Beginning with the summer of 2001, the Town completed 4 years of comprehensive water quality testing of marine waters and significant freshwater sources. More than 100 volunteers were trained to collect semiweekly samples from 46 sampling stations throughout the summer months. This effort was initiated under the guidance Dr. Brian Howes of the University of Massachusetts, School of Marine and Science Technology. SMAST has developed a program for coastal water quality modeling that has been adopted by the state as part of the Massachusetts Estuaries Project (MEP).

On a parallel track, the Orleans Water Quality Task Force has begun testing and evaluating each of the town's fresh water ponds.

Orleans voters allocated $375,000 for the development of environmental modeling of all marine water bodies in the town. This scientific data is necessary to understand what needs to be done to restore healthy waters. The funding has been accepted as the local match required for participation in the Massachusetts Estuaries Project (MEP). Orleans embayments are listed on the MEP priorities list, with water quality modeling reports expected in June 2005.

In addition to water quality modeling work, the Town of Orleans has two supporting studies also underway as of 2004. A federally funded Wastewater Management District study is examining the financial and administrative aspects of managing wastewater in Orleans. Also, Barnstable County has funded a feasibility study of the Tri Town septage treatment plant, exploring both continued use and options to expand treatment on the Tri-Town site. Both studies are detailed further in the Community Facilities chapter of this plan and are expected to be completed prior to the delivery of water quality models as part of the MEP.

Water quality data suggest that Town Cove and Pleasant Bay are being adversely affected by nutrient loading. Observation and anecdotal information reveal that algal areas have increased, eelgrass beds have diminished, and odors from bottom mud are more prevalent – all indicators of a change in the ecology caused by nutrient loading. The Town should consider the merits of

declaring these embayments as Nitrogen Sensitive Areas and developing regulations that limit nitrogen loading from both residential and business sources. (NR-8)

Nitrogen Sensitive Areas would include tidally restricted embayments which do not flush nutrients out of the water body quickly enough to prevent eutrophication. The sensitivity of a water body to nitrogen pollution would depend on such factors as contributing watershed, depth of water, residency time, etc. Solutions to excessive nitrogen for areas would need to be tailored to the specific conditions, and might include nitrogen-removing septic systems, community systems, or small, private wastewater treatment facilities.

The Department of Environmental Protection requires that Nitrogen Sensitive Areas be mapped based on scientific evaluations of the impacted water body. DEP places septic system limits on these areas so that no system releases more than 440 gallons of effluent daily per acre. This level may not be sufficient to protect water bodies from the effects of eutrophication. However, Title 5 permits local Boards of Health to adopt stricter regulations than the State for this purpose.

It has been documented that nitrogen from septic systems does not attenuate as it travels through the sub-soils and passes into the groundwater. The speed at which the groundwater travels has been estimated at 1 foot per day, meaning the adverse effects of nitrogen loading on water quality may not be fully reflected for several years. Alternative wastewater solutions must be explored if the Town is to reverse this trend of diminishing water quality due to nitrogen loading. (CF-27) Town Cove receives groundwater from the Village Center area, so the most beneficial approach may require some type of communal wastewater treatment facility or facilities. Around Pleasant Bay, where building densities are lower, other nitrogen-removing systems may be considered required.

Wastewater Impacts

Septic system effluent has been found to be the primary source of contaminants that cause coastal water quality degradation. In a conventional septic system, though most bacteria are removed from the wastewater, nutrients, particularly nitrogen, pass through and enter into the groundwater table, eventually discharging into coastal waters.

The effect of releasing additional nitrogen into water bodies is the same as applying fertilizer. Excessive plant growth can choke out other species, creating less diversity and disturbing the life cycle of many marine animals. For example, immature bay scallops require eelgrass, a plant that is highly sensitive to changes in water quality. Increased plant growth is also a component of eutrophication. When this growth dies off, the material left behind begins to decay, using up oxygen in the process. Low oxygen levels can cause fish kills and other harmful effects. The MWQTF began investigating nutrient levels in 1998. Data collected indicate that many of smaller ponds and coves at the head of Pleasant Bay are being affected by nitrogen loading. Kescayogansett Pond and Arey's Pond exhibit evidence of eutrophication at this time.

A Comprehensive Wastewater Management Plan is needed, and is recommended in the Community Facilities & Services chapter. This planning process has begun. Voters approved the first phase of the wastewater study at the May 2000 Town Meeting. In May of 2004 voters supported funding the second phase of the Comprehensive Wastewater Management Plan with

a scheduled completion date of 2007. The plan will recommend treatment options and facilities needed to protect the Town's coastal waters from the adverse effects of development.

"The Town may consider zoning and other regulatory measures to limit development within watersheds to sensitive coastal waters. Although most subdivision activity has already taken place, the Town should consider actions to limit nitrogen loading associated with future development.

"There are several measures that have the potential to help mitigate nitrogen loading associated with wastewater. Open space acquisition reduces overall development potential, along with the associated impacts of development. Transfer of Development Rights (TDR) is a concept by which nitrogen loading could be prevented in critical areas and allowed to occur in less sensitive locations. Land Averaging is a similar concept, except that nitrogen loading credits would have to be purchased by owners of small lots to ensure that the overall loading in the coastal watersheds stays below critical loading limits.

It is impossible to address nitrogen loading issues for Orleans without recognizing the environmental connections to Brewster, Harwich, Chatham, and Eastham. Groundwater does not respect political boundaries and much of the Town's groundwater basins lie in those surrounding towns. For example, nearly two-thirds of the watershed for Pleasant Bay is outside Orleans. Predicated on the results of the wastewater management plan, it may be necessary to designate the Pleasant Bay watershed as a District of Critical Planning Concern (DCPC) so that protective regulations can be developed. The Town should foster a working relationship with Brewster, Chatham, and Harwich to explore this possibility. This planning mechanism would allow the towns to concentrate on developing appropriate controls to limit nitrogen loading to the Bay.

Because the detrimental effects of nitrogen loading have significant environmental consequences, the Town should not stand in the way of residents who wish to install alternative septic systems. Encouragement of alternative septic systems should be done in a way that does not preclude congregate treatment options in the future. When the comprehensive Wastewater Management Plan is completed more stringent treatment may be required that can be achieved with advanced alternative systems. In addition, centralized or community septic systems may be needed in some areas of the Town.

Stormwater Runoff Impacts

Stormwater runoff has also been found to contribute to coastal water quality degradation. Untreated stormwater runoff from roads, parking lots, and residential areas carries contaminants such as petroleum products, fecal coliform bacteria, lawn pesticides and herbicides, and nutrients, including nitrogen. Testing for fecal coliform bacteria is used as an indicator of water quality for public health purposes. The safety of coastal waters for shellfishing and swimming is determined through water quality analysis for fecal coliform concentrations.

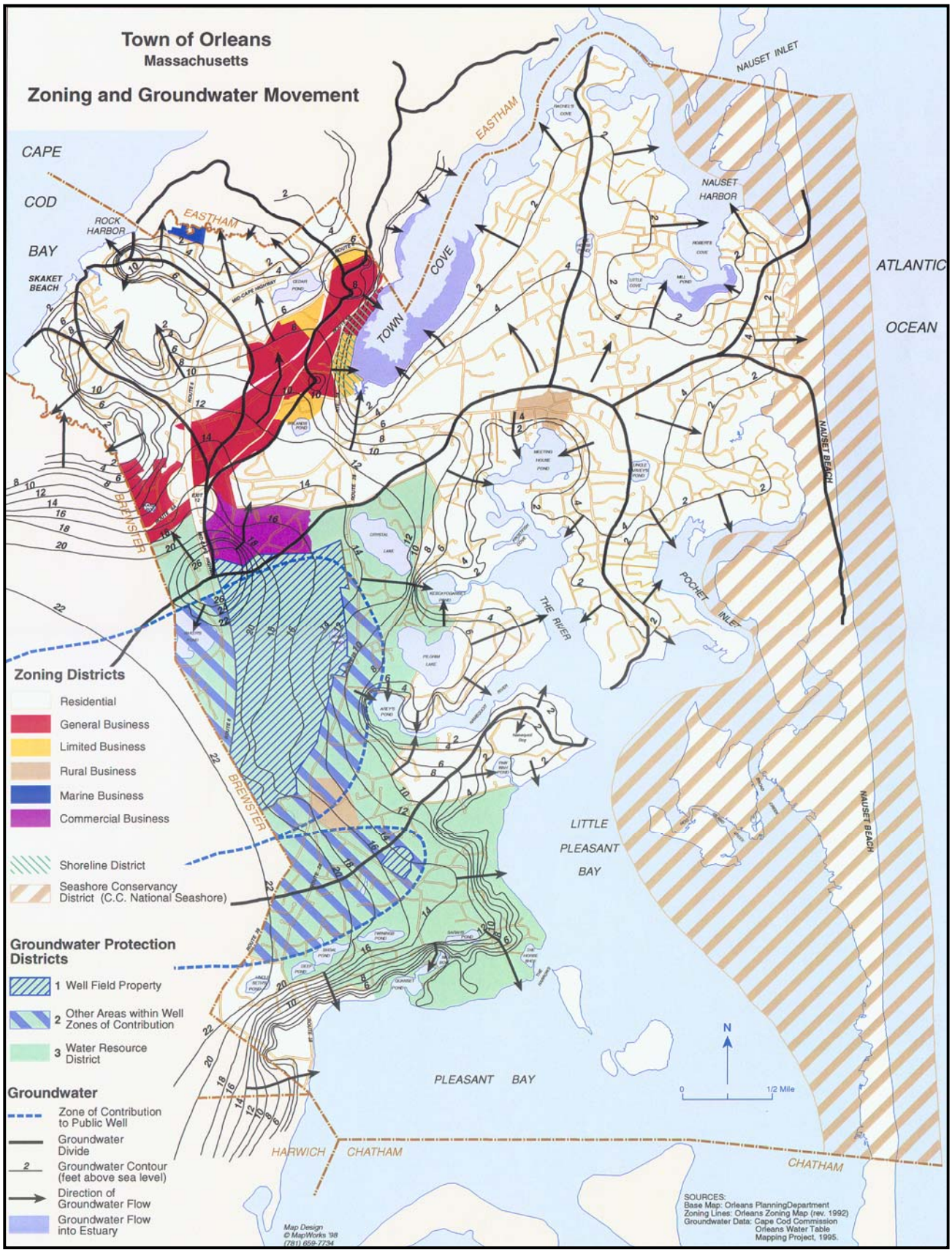
The Town formed the Marine Water Quality Task Force in 1987 to determine means to prevent fecal coliform from entering coastal waters. The Task Force identified all direct discharge points in the town, and instituted an extensive water quality monitoring and analysis program.

The Town instituted a drainage remediation program to mitigate the problems identified by the taskforce. All storm drains were mapped and prioritized. Five major drains were corrected in 1993 and five more were completed in 1999. In 1997-1998, the Town expanded its efforts to study the eutrophication effects of five sub-embayments: Meeting House Pond, Kescayogansett Pond, Areys Pond, Paw-Wah Pond and Quanset Pond.

It should be the policy of the town of Orleans that no untreated stormwater be discharged directly into coastal waters. The Town should continue to support and fund coastal water quality monitoring and remediation of existing problem drainage sites. (NR-7)

Groundwater Impacts

Studies show that the areas of high groundwater intrusion are also the areas of highest nutrient content in the water. The dominant land-based source of nitrogen is septic waste from both approved Title 5 septic systems and older cesspools. A secondary source is landscape fertilizer. Controlling the extent of the problem is directly related to land use practices by individual homeowners. Policies to restrict or eliminate fertilizer, especially on lawns within 100 feet of a wetland, would help reduce the amount of excess nutrients that reaches these areas. (NR-9, NR-10) Without policies to promote alternative septic designs that reduce nitrogen at the source and prevent it from entering the ground water, the bays and other water bodies will continue to receive damaging nitrates for years to come.


Town of Orleans
Massachusetts
Zoning and Groundwater Movement
CAPE
COD
BAY
SKAKET BEACH
ROCK HARBOR
EASTHAM
TOWN COVE
NAUSET INLET
NAUSET HARBOR
ATLANTIC
OCEAN
NAUSET BEACH
POCHET INLET
THE RIVER
BREWSTER
LITTLE PLEASANT BAY
PLEASANT BAY
HARWICH
CHATHAM
Zoning Districts
Residential
General Business
Limited Business
Rural Business
Marine Business
Commercial Business
Shoreline District
Seashore Conservancy District (C.C. National Seashore)
Groundwater Protection Districts
1 Well Field Property
2 Other Areas within Well Zones of Contribution
3 Water Resource District
Groundwater
Zone of Contribution to Public Well
Groundwater Divide
Groundwater Contour (feet above sea level)
Direction of Groundwater Flow
Groundwater Flow into Estuary
N
0
1/2 Mile
Map Design
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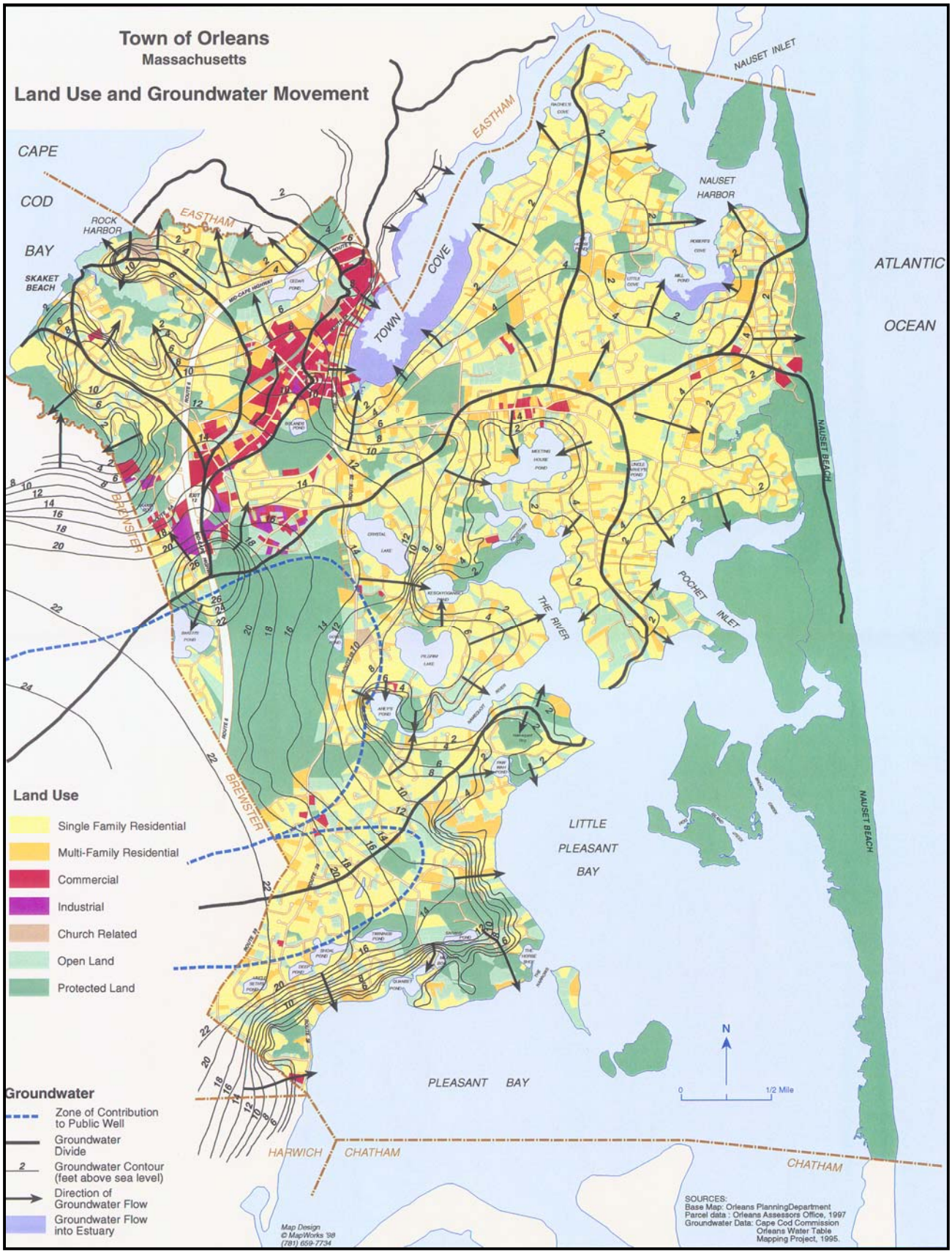
(781) 659-7734
SOURCES:
Base Map: Orleans PlanningDepartment
Zoning Lines: Orleans Zoning Map (rev. 1992)
Groundwater Data: Cape Cod Commission
Orleans Water Table
Mapping Project, 1995.


Town of Orleans
Massachusetts
Land Use and Groundwater Movement
CAPE
COD
BAY
ROCK HARBOR
EASTHAM
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NAUSET INLET
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LITTLE PLEASANT BAY
PLEASANT BAY
HARWICH
CHATHAM
Land Use
Single Family Residential
Multi-Family Residential
Commercial
Industrial
Church Related
Open Land
Protected Land
Groundwater
Zone of Contribution to Public Well
Groundwater Divide
Groundwater Contour (feet above sea level)
Direction of Groundwater Flow
Groundwater Flow into Estuary
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1/2 Mile
SOURCES:
Base Map: Orleans PlanningDepartment
Parcel data : Orleans Assessors Office, 1997
Groundwater Data: Cape Cod Commission
Orleans Water Table
Mapping Project, 1995.
Map Design
© MapWorks '98
(781) 659-7734

Beach and Shoreline Protection

Flood zones

Federal Emergency Management Agency, (FEMA) maps show that extensive areas of the Town are located within the 100-year flood zone. Low elevation properties around the marsh creeks of Cape Cod Bay, Nauset Harbor and Pleasant Bay are presently at risk from flooding. The flood zone maps for Pleasant Bay were adjusted after the 1987 breach in Chatham from the 10-foot contour representing the 100-year storm level to the 13-foot contour. As a result, the flood zones were expanded.

Although the Building Code allows construction in the flood zone, it is not considered desirable due to the potential for storm damage. Flood insurance maps supplied by FEMA show the location of Velocity Zones (V Zones) within Orleans. These are "areas of the 100-year flood zone with velocity (wave action)," which can cause significant damage to buildings and structures. The Town should discourage building in the FEMA V zones, which are areas subject to coastal storm wave action and currents. (NR-11)

5.4.2 Surface Water: Lakes and Ponds

Water quality in the ponds is considered good, and at present there are no indications that the ponds are affected by pollution, with the exception of Cedar Pond (discussed below). Nonetheless, pollution of ponds in other towns has occurred. In fresh water, phosphorus is the limiting factor which keeps plants and algae from excessive growth. Direct discharge of stormwater into surface waters is prohibited. (NR-12) Currently, the Town has monitoring programs for both its salt water areas and fresh water ponds.

The water quality of Cedar Pond (a Great Pond) is poor, resulting in fish kills and algae blooms. Increased industrial and residential development near the pond and its location next to Route 6 has contributed to its decline. However, a major pollutant source is the hundreds of cormorants that frequent the pond in the summer and roost on the power lines over the water. In 1999, the Town started a program to prevent the birds from roosting on the power lines by scaring them off with loud noises in the afternoon. This approach has been met with good success limiting the pollution from the birds.

5.4.3 Water Recreation

Issues at Public Beaches

Nauset Beach has a 1,000 car capacity parking area, bathhouse and concession stand. It is the starting point and check-in area for off-road vehicles to travel toward Chatham. The Atlantic shore continues to erode, reducing the beach area. In 2002, the Town installed a new septic system beneath the parking lot, further away from the beach. Funding is currently being sought to renovate the bathhouse and concession stand.

A new parking area further from the beach may be needed if the existing area is rendered unusable by erosion. At this time there is approximately 250 feet of dune area between the parking lot and the ocean. The current erosion rate of Nauset Beach is approximately five feet per year. At this rate the waters edge may reach the parking lot in approximately 50 years.

Skaket Beach on Cape Cod Bay has a 170 car capacity parking area, bathhouse and concession stand. The popularity of this beach is greater than its parking capacity. The beach suffers from erosion but the Town has a permit to excavate sand from the extensive surrounding sand flats and to place the sand on the beach. Beach nourishment by the Town should continue at Skaket Beach to maintain existing recreational opportunities. (NR-15)

Pleasant Bay on Route 28 in South Orleans has a small beach with limited parking on the State highway. There are no public facilities. The Town owns several acres of open space land across the highway but it was purchased with the caveat that it would not be used for parking. The area is one of the most popular mooring areas for Pleasant Bay. There have been no plans or proposals to increase either the beach area or parking facilities.

A critical area of parking need is at Crystal Lake, where beachgoers routinely park along public streets when the small parking area is full. However, before expanding any beach parking areas, the Town should carefully consider what the maximum usage of the beach should be so that excessive use does not ruin the desirable features of the area. The Conservation Commission manages the area, and in 2001 determined that more parking would lead to excessive use of the small beach area. ADA-compliant portable restrooms are located at the site during the summer season.

Docks & Piers

As more homes are built along the coast, there is a concern that increasing the number of docks and piers will have an adverse impact on water quality and the public's ability to enjoy the shore. In 2001 the Pleasant Bay Alliance member Towns adopted regulations that prohibited new docks and piers in most of Pleasant Bay.

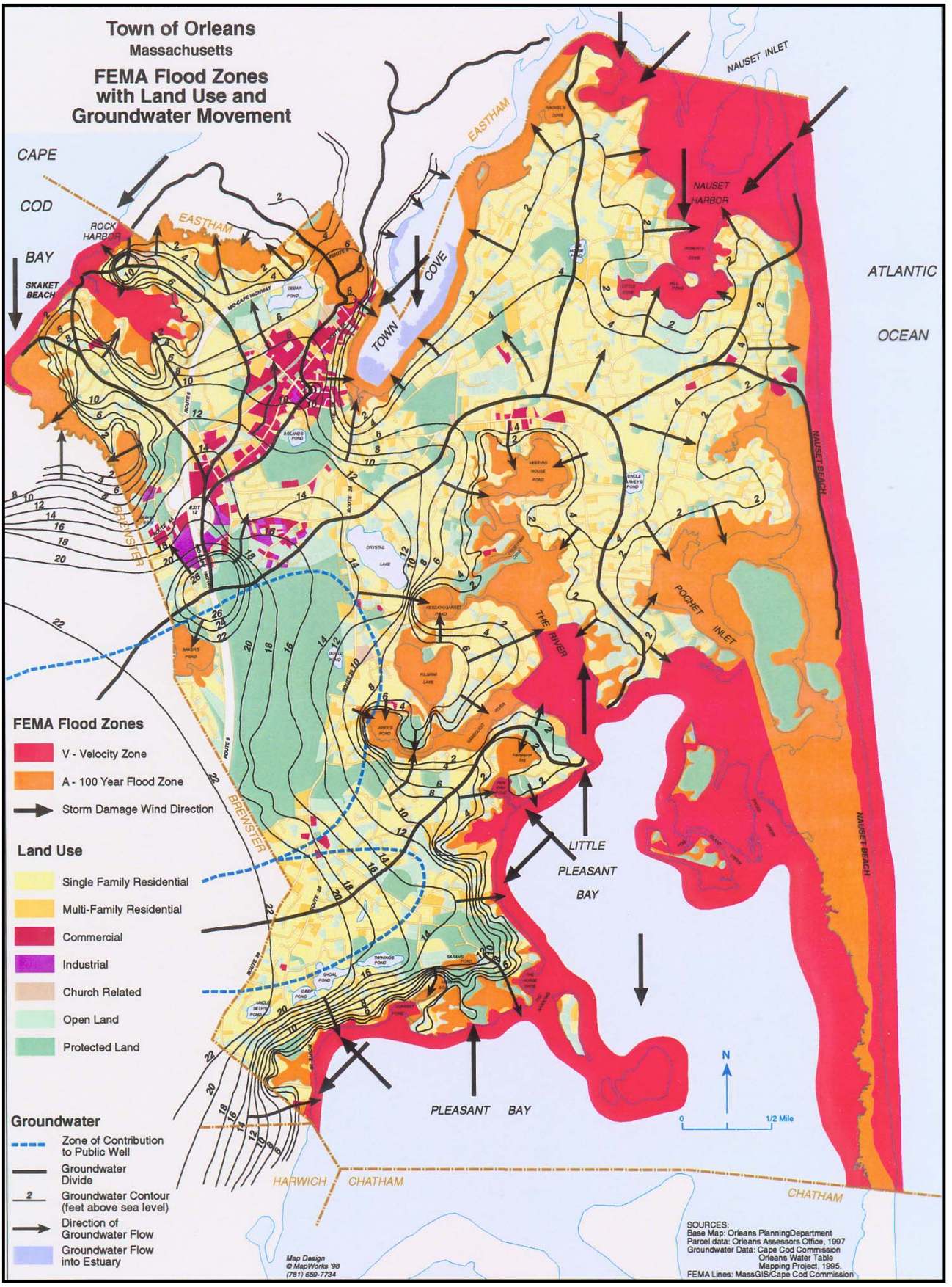
Discharges from Boats

An important source of coastal pollutants is wastewater discharged from boats. The Commonwealth has begun the process of declaring all waters in the State as no-discharge zones. Until this action is completed, it is recommended that the Town declare all waterways in Orleans as "No Discharge Zones." In addition, the permitting process for docks and piers in salt and fresh waters should follow clear criteria for water quality and shoreline preservation. (NR-17)

5.4.4 Aquifer and Groundwater

The 13.1 square miles of upland in Orleans flow into 10 separate watersheds. Of immense importance is the area around the center of the town where the flow is in three different

directions. A complete description of the public water supply system may be found in the Community Facilities & Services Chapter.


Town of Orleans
Massachusetts
FEMA Flood Zones with Land Use and Groundwater Movement
CAPE COD BAY
ATLANTIC OCEAN
NAUSET INLET
NAUSET HARBOR
EASTHAM
ROCK HARBOR
SKAKET BEACH
TOWN COVE
NAUSET BEACH
POCHET INLET
THE RIVER
LITTLE PLEASANT BAY
PLEASANT BAY
BREWSTER
HARWICH
CHATHAM
FEMA Flood Zones
V - Velocity Zone
A - 100 Year Flood Zone
Storm Damage Wind Direction
Land Use
Single Family Residential
Multi-Family Residential
Commercial
Industrial
Church Related
Open Land
Protected Land
Groundwater
Zone of Contribution to Public Well
Groundwater Divide
Groundwater Contour (feet above sea level)
Direction of Groundwater Flow
Groundwater Flow into Estuary
N
0
1/2 Mile
Map Design © MapWorks '98 (781) 659-7734
SOURCES:
Base Map: Orleans PlanningDepartment
Parcel data: Orleans Assessors Office, 1997
Groundwater Data: Cape Cod Commission
Orleans Water Table Mapping Project, 1995.
FEMA Lines: MassGIS/Cape Cod Commission

Watershed Protection

Protection of the watershed is of primary concern. Orleans' Zones of Contribution (or recharge areas) to its major wellfields has one of the highest percentages of protected open space of any on Cape Cod. This includes not only the 500-acre watershed itself but also the 1,800 acre Nickerson State Park in Brewster, and 16 acres adjacent to Baker's Pond.

The Zoning Bylaw would have to be amended requiring a 4/5 majority in order to use the land in the Watershed for a purpose other than the production of drinking water. In addition, the original Act of the Legislature would have to be amended and several other regulations would have to be changed. The Town should continue to protect the Zones of Contribution of the public water supply by pursuing programs of land acquisition and applying for grant funding. (NR-20)

Although the Town has protected more than 500 acres around the public wellfields, the contributing land area to those wells is many times larger. Water that enters the ground within the Area of Contribution (DEP Zone II) of a well can eventually become part of the recharge to that well. For Orleans wells, the Zone II extends into Brewster. It is therefore prudent for the Town to work with Brewster officials to protect lands within the contributing area of the wells.

5.4.5 Wetland, Wildlife, and Plant Habitat Analysis

Existing wetlands have, to a great extent, been protected from human alteration in Orleans. Degraded water quality in wetlands, and its impact on rare or endangered species remain concerns. The threat of invasive species replacing native species is also a concern.

Habitat for rare and endangered species in Orleans should be protected in hope of providing enough habitat for the population of the threatened flora or fauna to restore itself. In order to permanently protect rare species, it is recommended that lands known to contain such creatures and plants be a priority for open space acquisition. The Commonwealth's Natural Heritage Maps should be used for such determinations. (NR-21)

Vernal pools support many rare species, and should be targeted for protection. Any new vernal pools should be added to the Commonwealth certification list. This allows the Conservation Commission to exercise regulatory authority to protect vernal pools. (NR-22)

Another significant component of habitat preservation is to provide wildlife corridors that allow wild animals to complete their lifecycles free from human obstruction. The Cape Cod Commission has mapped proposed wildlife corridors, including corridors through Orleans. These areas should continue to be part of the review criteria for potential open space acquisitions. (NR-23)

Invasive species, especially in wetland areas, are becoming a problem in coastal and fresh water bodies. When a new species is introduced to a habitat in which it can dominate, other species of plants and animals suffer, upsetting the natural balance of the ecosystem. Examples of invasive

species are abundant and diverse, such as phragmites replacing cattails in swamps. While the task of removing invasive species from the wild and restoring native populations is an enormous undertaking, the Town can take action to require that only native plants are permitted in sensitive resource areas. It is recommended that the Town adopt a regulation that will require waterfront property owners to plant only native species within 50 feet of the resource area. (NR-24) It is also suggested that the Town explore and evaluate methods and the cost of programs to eradicate non-native species. (NR-25)

5.5 Implementation Program

	Action	Time for Completion	Resources Required	Lead Responsible Agency
NR-1	Continue to work with school officials to encourage the participation of students in resource enhancement programs.	Ongoing	L	Shellfish Dept.
NR-2	***Develop an overall shellfish management program, funded primarily through licensing fees, to protect and enhance local resources.***	***Addressed See Appendix***	***M***	***Shellfish Dept.***
NR-3	Explore and evaluate methods and programs to expand local shellfish resources through the Town's propagation program consistent with preservation of water quality.	Ongoing	L	Shellfish Dept.
NR-4	***Consider creating a shellfish revolving fund to provide financial support of shellfish enhancement programs.***	***Addressed See Appendix***	***L***	***Board of Selectmen***
NR-5	Continue to pursue grants for projects that will enhance shellfish resources.	Ongoing	L	Shellfish Dept.
NR-6	Prevent direct discharge of untreated stormwater into coastal embayments and ponds.	FY 07-10	H	Highway Dept.
NR-7	***Continue marine water quality monitoring through volunteers and financial support of the Town.***	***Addressed See Appendix***	***L***	***Board of Selectmen***
NR-8	Consider the designation of watershed areas contributing to the embayments of Town Cove, Pleasant Bay, and Cape Cod as Nitrogen Sensitive Areas.	FY 07-10	M	Board of Health
NR-9	***Develop an active public awareness program to encourage minimum use of fertilizers, herbicides and pesticides.***	***Addressed See Appendix***	***L***	***Conservation Commission***
NR-10	Develop a minimal use program for fertilizers, pesticides, and herbicides on all Town owned properties.	FY 07-10	L	Parks & Beaches Department
NR-11	***Consider adopting and enforcing regulations to limit development in FEMA V Zones.***	***Addressed See Appendix***	***L***	***Conservation Commission***
NR-12	Prevent direct discharge of untreated stormwater into fresh water bodies.	FY 07-10	H	Highway Dept.
NR-13	***Develop and implement a program of water quality monitoring for the Town's fresh waters.***	***Addressed See Appendix***	***L***	***Board of Selectmen***

NR-14	***Continue efforts to permanently solve the cormorant problem at Cedar Pond.***	***Addressed See Appendix***	***L***	***Board of Selectmen***
NR-15	Continue beach nourishment at Skaket Beach.	Ongoing	M	Parks & Beaches
NR-16	***Develop criteria for new docks and shoreline structures. Make regulations consistent with the recommendations of the Pleasant Bay Resource Management Plan.***	***Addressed See Appendix***	***L***	***Conservation Commission***
NR-17	Declare all coastal waters as No Discharge Zones.	FY 07-10	L	Board of Selectmen
NR-18	Develop criteria for permitting docks and piers in fresh water ponds.	FY 07-10	L	Conservation Commission
NR-19	***Establish a management plan for the Town Watershed areas.***	***Addressed See Appendix***	***L***	***Board of Water Commissioners***
NR-20	Continue to protect Zones of Contribution of the public water supply through programs of land acquisition.	Ongoing	H	Open Space/ Land Bank Committee
NR-21	Permanently protect lands containing endangered or threatened species as identified by the Massachusetts Natural Heritage Program and the Endangered Species Act.	Ongoing	H	Open Space /Land Bank Committee
NR-22	Identify all vernal pools located within the Town to ensure their proper regulation by the Conservation Commission.	FY 07-10	L	Conservation Commission
NR-23	Continue to make preservation of wildlife corridors a consideration of programs of land acquisition and conservation.	Ongoing	L	Open Space /Land Bank Committee
NR-24	***Consider adopting a regulation that will require waterfront property owners to plant only native species within 50 feet of a resource area.***	***Addressed See Appendix***	***L***	***Conservation Commission***
NR-25	Explore and evaluate methods and the cost of programs to eradicate non-native species.	FY 07-10	L	Conservation Commission
NR-26	***Water quality measurements for Namskaket Creek, Mill Pond, and Town Cove should be incorporated into the efforts of the Water Quality Task Force.***	***Addressed See Appendix***	***M***	***Water Quality Task Force***
NR-27	Upon completion of the Wastewater Management Plan, adopt nitrogen loading standards for all watershed areas that will protect the ecological integrity of the Town's coastal waters.	FY 07-10	M	Board of Health
NR-28	***Consider adopting a regulation that would require advanced treatment whenever a septic system setback is less than 100 feet from a wetland resource.***	***Addressed See Appendix***	***M***	***Board of Health***
NR-29	***Amend the Site Plan Review section of the Zoning Bylaw to provide for the protection of specimen trees.***	***Addressed See Appendix***	***L***	***Planning Board***

NR-30	*Investigate the feasibility and implications of extending the current 50-foot undisturbed wetland buffer to 100 feet for the entire town.*	*Addressed See Appendix*	*M*	*Conservation Commission*